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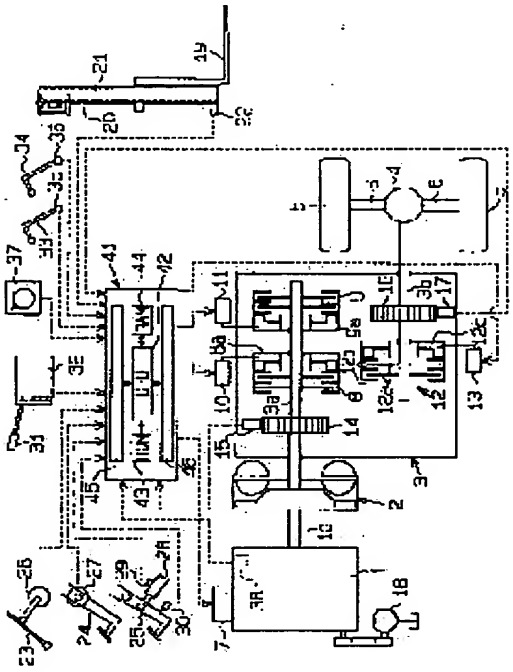
(54) BRAKING CONTROL DEVICE FOR INDUSTRIAL VEHICLE

(57)Abstract:
PROBLEM TO BE SOLVED: To relatively reduce a maintenance frequency of a braking device even if a braking using frequency is high in an industrial vehicle.
SOLUTION: A transmission 3 operationally connected to a torque converter 2 of an engine type forklift has a forward clutch 8 and a reverse clutch 9. Both clutches 8, 9 are wet clutches. A control device 41 generates a pseudo- dynamic brake as a torque converter unmounted vehicle by simultaneously engaging the forward clutch 8 and the reverse clutch 9 by controlling clutch valves 10, 11 when an accelerator pedal 23 is not operated at forklift traveling time. The control device 41 brakes a vehicle by simultaneously engaging the forward clutch 8 and the reverse clutch 9 under clutch engaging pressure corresponding to a brake operation quantity by controlling the clutch valves 10, 11 when a brake pedal 25 is operated. That is, the forward/reverse clutches 8, 9 are used for braking.



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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the braking control unit of the industrial vehicle which carries out control which generates the damping force for false dynamic brake (engine brake) or the brake at the time of brakes operation in industrial vehicles, such as a fork lift truck which equips a torque converter between an engine and the clutch for transit.
[0002]
[Description of the Prior Art] Conventionally, in the fork lift truck which is an engine vehicle, when treading in of an accelerator pedal is stopped during transit, the mechanical dynamic brake (engine brake) according to the fall of an engine speed works. Moreover, if a brake pedal is broken in, service brakes (service brake), such as a drum brake prepared in the wheel, will operate, and a car will be braked.
[0003]
[Problem(s) to be Solved by the Invention] In recent years, there is much what uses the change gear which also equipped the fork lift truck with the torque converter. The effectiveness condition of dynamic brake is [fork lift truck / equipped with a torque converter / torque-converter a non-equipped vehicle] relatively weak. For those who use torque-converter the fork lift truck which is not equipped [conventional], thing insufficient may be sensed for the feeling of moderation, and there is a demand that he wants a feeling of moderation equivalent to torque-converter a non-equipped vehicle.
[0004] In order to strengthen a feeling of moderation, it is possible to adopt the false dynamic brake which controls a damping device by control devices, such as a controller, gives a weak brake force, and strengthens deceleration. Conventionally, by the fork lift truck, as a damping device, the drum brake is used as a service brake, and it is possible to generate false dynamic brake using a drum brake.
[0005] On the other hand, when a brake pedal is broken in, the drum brake which is a service brake operates. A fork lift truck is used for conveyance of a load, and a brake is frequently used for load picking or whenever [of every load]. Furthermore, a drum brake operates also by operating an inching pedal in the case of a cargo work activity. Thus, since brake use frequency of a fork lift truck is high, components wear of service brakes, such as a drum brake, is comparatively frequently [it is intense and / the maintenance of exchange of brake components etc.] needed.
[0006] For this reason, when service brakes, such as a drum brake, were used for false dynamic brake, there was a problem that consumption of the components of a service brake became much more intense, and that maintenance frequency became still higher. Using what has endurance in the components quality of the materials, such as a drum brake, was considered, and there was a limitation also in it. Since it becomes impossible to use a fork lift truck in the meantime when maintenance frequency becomes high, a problem arises on working efficiency.
[0007] This invention is made in view of the aforementioned trouble, and the purpose is in offering the braking control unit of the industrial vehicle which can finish the maintenance frequency of a damping device few comparatively [with high braking use frequency].

[0008]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem in invention according to claim 1 The change gear equipped with the hydraulic advance clutch and hydraulic go-astern clutch which transmit an engine output to an output shaft through a torque converter, The control valve which fluctuates the oil pressure of the pressure receiving interior of a room of said each clutch, and adjusts a connection condition, The braking means of a clutch type established on the drive transfer shaft to which between said torque converters and said driving wheels is connected, A shift actuated-valve-position detection means to detect the actuated valve position of advance, neutrality, and go-astern of the shift actuation means for carrying out change-over actuation of said change gear, It is based on each detection value of an accelerator control input detection means to detect the control input of an accelerator actuation means, and a said shift actuated-valve-position detection means and said accelerator control input detection means. When it is judged as the actuation stage of false dynamic brake when said accelerator actuation means is not operated at least after said shift actuation means has been operated by advance or go-astern The clutch engagement pressure according to the setting deceleration of the false dynamic brake set up beforehand is equipped with the control means which controls said braking means.
[0009] If a decision means judges in case of the actuation stage of false dynamic brake when the accelerator actuation means is not operated at least after the shift actuation means has been operated by advance or go-astern according to this configuration, a control means will control a braking means to the clutch engagement pressure from which setting deceleration is acquired, and the false dynamic brake according to that clutch engagement pressure will generate it. Although braking use frequency becomes high since the braking means of a clutch type established on the drive transfer shaft to which between a torque converter and driving wheels is connected is used, the maintenance frequency of a braking means is low compared with the drum brake currently used conventionally, and it ends. Moreover, the long-term life of a braking means is guaranteed compared with the conventional drum brake etc.
[0010] In invention according to claim 2, in invention according to claim 1, it has a setting actuation means to set up said setting deceleration, and let it be a summary for said control means to control the clutch engagement pressure of said braking means so that the false dynamic brake of the setting deceleration set up by said setting actuation means is obtained.
[0011] According to this configuration, since a control means controls the clutch engagement pressure of a braking means so that the false dynamic brake of the setting deceleration set up by actuation of a setting actuation means is obtained, it enables an operator etc. to carry out a selection setup of the effectiveness condition (strength) of false dynamic brake according to liking.
[0012] In invention according to claim 3, in invention according to claim 1 or 2, it has a load detection means to detect the weight of the load loaded into the car, and said control means makes it a summary to ask for the clutch engagement pressure of said braking means in consideration of the load based on the detection value of said load detection means so that said predetermined deceleration may be acquired.
[0013] Since the clutch engagement pressure of the braking means set up when false dynamic brake cuts in credit is decided in consideration of the weight of the load loaded into the industrial vehicle according to this configuration, it is not influenced by the weight of a load etc. but a car is slowed down always mostly with setting deceleration.
[0014] In invention according to claim 4, in invention given in any 1 term of claims 1-3, said advance clutch and a go-astern clutch serve as said braking means, and said control means makes it a summary to make the clutch engagement pressure from which said setting deceleration is acquired carry out coincidence engagement of said advance clutch and the go-astern clutch.
[0015] According to this configuration, an advance clutch and a go-astern clutch are used as a braking means, and the damping force for false dynamic brake is acquired by making the clutch engagement pressure from which setting deceleration is acquired carry out coincidence engagement of an advance clutch and the go-astern clutch. Since an advance clutch and a go-

astern clutch are used, although braking use frequency increases by adoption of false dynamic brake, the maintenance frequency of a damping device cannot increase easily.
[0016] Invention according to claim 5 is a parking-brake means by which said braking means was established on said drive transfer shaft, in invention given in any 1 term of claims 1-3, and said control means makes it a summary to control said parking-brake means to the clutch engagement pressure from which said setting deceleration is acquired.
[0017] According to this configuration, a parking brake is used as a braking means and the damping force for false dynamic brake is acquired by controlling a parking brake to the clutch engagement pressure from which setting deceleration is acquired. Since a parking brake is used, although braking use frequency increases by adoption of false dynamic brake, the maintenance frequency of a damping device cannot increase easily.
[0018] As for an industrial vehicle, invention according to claim 6 is equipped with a vehicle speed detection means in invention given in any 1 term of claims 1-5, and said control means makes it a summary to carry out vehicle speed feedback control of the engagement pressure of said braking means so that it may become the clutch engagement pressure from which said setting deceleration is acquired.
[0019] Since according to this configuration vehicle speed feedback control of the clutch engagement pressure of a braking means is carried out so that setting deceleration may be acquired when the false dynamic brake works, it is not influenced by the weight of the load which an industrial vehicle loads etc., but a car is always slowed down with setting deceleration.
[0020] The change gear equipped with the hydraulic advance clutch and hydraulic go-astern clutch which transmit an engine output to an output shaft through a torque converter in invention according to claim 7, In the industrial vehicle equipped with the shift actuation means for carrying out change-over actuation of this change gear, and the shift means for switching which switches said advance clutch and a go-astern clutch to the connection condition according to the actuated valve position of advance, neutrality, and go-astern of this shift actuation means The braking means of a clutch type established on the drive transfer shaft to which between a brakes operation means to operate it in order to make a car brake, and said torque converters and said driving wheels is connected, When said brakes operation means is operated, it has the damping force generating means with which the braking means of said clutch type is made to engage with the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired.
[0021] When a brakes operation means is operated, in order to make the braking means of a clutch type engaged with the clutch engagement pressure from which the damping force [means / damping force generating] according to the control input of a brakes operation means is acquired according to this configuration, the damping force according to the amount of brakes operation is acquired. Since the braking means of a clutch type established on the drive transfer shaft to which between a torque converter and driving wheels is connected is used, even if braking use frequency is high, the maintenance frequency of a braking means is low compared with the drum brake currently used conventionally, and it ends. Moreover, the long-term life of a braking means is guaranteed compared with the conventional drum brake etc.
[0022] The change gear equipped with the hydraulic advance clutch and hydraulic go-astern clutch which transmit an engine output to an output shaft through a torque converter in invention according to claim 8, The control valve which fluctuates the oil pressure of the pressure receiving interior of a room of said each clutch, and adjusts a connection condition, The braking means of a clutch type established on the drive transfer shaft to which between said torque converters and said driving wheels is connected, A shift actuated-valve-position detection means to detect the actuated valve position of advance, neutrality, and go-astern of the shift actuation means for carrying out change-over actuation of said change gear, It has an amount detection means of brakes operation to detect the control input of a brakes operation means, and the control means which controls said braking means to the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired based on the detection value of said amount detection means of brakes operation.

[0023] If a brakes operation means is operated according to this configuration, a control means will control a braking means to the clutch engagement pressure from which the damping force according to the control input of a brakes operation means is acquired, and the damping force according to that clutch engagement pressure will be acquired. Since the braking means of a clutch type established on the drive transfer shaft to which between a torque converter and driving wheels is connected is used, even if braking use frequency is high, the maintenance frequency of a braking means is low compared with the drum brake currently used conventionally, and it ends. Moreover, the long-term life of a braking means is guaranteed compared with the conventional drum brake etc.
[0024] In invention according to claim 9, it is that in which said brakes operation means carries out treading-in actuation in invention according to claim 8. It has a hydraulic treading strength generating means to generate treading strength when said brakes operation means is broken in and operated. Said amount detection means of brakes operation It is a treading strength detection means to detect treading strength from the oil pressure of said treading strength generating means, and said control means makes it a summary to control said braking means to set up a fixed initial brake force in the weak initial field of the treading strength based on the detection value of said treading strength detection means.
[0025] the time of operating a brakes operation means lightly (weakly) according to this configuration -- the oil pressure of a hydraulic treading strength generating means -- standing -- hard -- the detection value of a treading strength detection means -- dispersion -- being easy . Based on the detection value of a treading strength detection means, in the weak initial field of treading strength, a braking means is controlled by the control means so that a fixed initial brake force is set up. Therefore, in the initial field of actuation of a brakes operation means, generating of small damping force required to become is guaranteed.
[0026] In the condition of judging that the actuated valve position of said shift actuation means is a center valve position in invention according to claim 8 or 9 in invention according to claim 10 based on the detection value of said shift actuated-valve-position detection means If it judges that said brakes operation means was operated, in case said control means controls said braking means to the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired, it will make it a summary to perform processing which makes the starting inclination of the clutch engagement pressure ease.
[0027] According to this configuration, where a shift actuation means is operated in a center valve position, since processing which makes the starting inclination of the clutch engagement pressure of a braking means ease is performed when a brakes operation means is operated, a shock when brakes operation is carried out during transit in the condition that the clutch was separated in the shift center valve position is eased.
[0028] In invention according to claim 11, in invention according to claim 8 to 10, an industrial vehicle is equipped with a vehicle speed detection means and a parking-brake means, and if it judges that said control means has the vehicle speed in the halt vehicle speed where said brakes operation means is operated based on each detection value of said amount detection means of brakes operation, and a vehicle speed detection means, let it be a summary to operate a parking-brake means.
[0029] If it is judged according to this configuration that the vehicle speed is in the halt vehicle speed where a brakes operation means is operated based on each detection value of the amount detection means of brakes operation and a vehicle speed detection means, a parking-brake means will operate. For this reason, after the stop, even if it stops actuation of a brakes operation means, the parking brake is effective. For example, a roll back is not carried out even if it stops brakes operation after a stop by the ramp for re-start.
[0030] In invention according to claim 12, in invention according to claim 8 to 11, said advance clutch and a go-astern clutch serve as said braking means, and said control means makes it a summary to make the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired carry out coincidence engagement of said advance clutch and the go-astern clutch.
[0031] According to this configuration, an advance clutch and a go-astern clutch are used as a

braking means, and damping force is acquired by carrying out coincidence engagement of an advance clutch and the go-astern clutch with the clutch engagement pressure from which the damping force according to the control input of a brakes operation means is acquired. Since an advance clutch and a go-astern clutch are used, even if braking use frequency is high, it can be managed by the maintenance frequency of a damping device few. Moreover, it also becomes possible to abolish service-brake equipments, such as the conventional drum brake.
[0032] In invention according to claim 13, in invention according to claim 8 to 11, said braking means is a parking-brake means of a clutch type established on said drive transfer shaft, and makes it a summary for said control means to control said parking-brake means to the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired.
[0033] According to this configuration, a parking-brake means is used as a braking means, and damping force is acquired by making a parking-brake means engaged with the clutch engagement pressure according to the control input of a brakes operation means. Since a parking-brake means is used, even if braking use frequency is high, it can be managed by the maintenance frequency of a damping device few. Moreover, it also becomes possible to abolish the conventional service-brake equipments, such as a drum brake.
[0034] In invention according to claim 14, in invention according to claim 8 to 13, the braking means of said clutch type is formed in the interior of said change gear, and the auxiliary braking means which operates at least in the location of this driving wheel approach based on actuation of said brakes operation means at the time of a car halt is established at least on the power transfer path from said change gear to said driving wheel.
[0035] When according to this configuration a brakes operation means is operated and an industrial vehicle stops at least, the braking means of a clutch type formed in the interior of a change gear and the auxiliary braking means established on the power transfer path from a change gear to a driving wheel in the location of driving wheel approach operate to coincidence. For this reason, since braking is added not only to the interior of a change gear but to the location of driving wheel approach at coincidence, ****** cannot occur in the power transfer shaft between a change gear and a driving wheel easily, and shake return of the car body by that restoration that can be twisted stops being able to occur easily. Therefore, a car body shake-comes to be hard at the time of a halt of an industrial vehicle.
[0036]
[Embodiment of the Invention] (1st operation gestalt) The 1st operation gestalt which materialized this invention to the fork lift truck as an industrial vehicle is hereafter explained according to a drawing.
[0037] As shown in drawing 1 , output-shaft 1a of an engine 1 is connected with the change gear 3 equipped with the torque converter 2, and the change gear 3 is connected with the axle 6 which has a driving wheel 5 through a differential gear 4. The throttle actuator 7 is formed in an engine 1, and by actuation of the throttle actuator 7, throttle opening is adjusted and the engine speed of an engine 1, i.e., the engine speed of output-shaft 1a of an engine 1, is adjusted.
[0038] A change gear 3 is equipped with input-shaft (main shaft) 3a and output-shaft (countershaft) 3b, and the advance clutch 8 and the go-astern clutch 9 are formed in input-shaft 3a. With this operation gestalt, the advance clutch 8 and the go-astern clutch 9 are used as a braking means of a clutch type. Between the advance clutch 8 and the go-astern clutch 9, and output-shaft 3b, the gear train which is not illustrated is established, respectively, and rotation of input-shaft 3a is transmitted to output-shaft 3b through each clutches 8 and 9 and each gear train. With a hydraulic clutch and the gestalt of this operation, a multiplate wet clutch is used for both the clutches 8 and 9, and if the oil pressure force in pressure receiving room 8a and 9a raises the oil pressure force in pressure receiving room 8a and 9a possible [accommodation of the connection force], it is constituted so that the connection force may become large. The oil pressure force in pressure receiving room 8a and 9a is controlled by oil pressure to which the advance clutch 8 and the go-astern clutch 9 are supplied through the advance clutch bulb 10 and the go-astern clutch bulb 11 as a control valve. The advance clutch bulb 10 and the go-astern clutch bulb 11 consist of proportionality solenoid valves used as the

opening proportional to the amount of energization to a solenoid.
[0039] The parking-brake clutch (parking brake) 12 is formed in output-shaft 3b of a change gear 3. That is, the parking brake 12 is built into the change gear 3. The parking brake 12 is equipped with output-shaft 3b, disk 12a which really rotates, and brake-friction-pad 12b prepared in rotation impossible and the thrust direction movable to output-shaft 3b. Brake-friction-pad 12b is energized in the direction as for which a pressure welding is carried out to disk 12a by the spring force of the spring which is not illustrated, generates the engagement pressure for braking, and it is constituted so that a braking condition may be canceled by the oil pressure supplied to pressure receiving room 12c through the parking-brake clutch bulb 13. The solenoid valve is used for the parking-brake clutch bulb 13.
[0040] Although a torque converter 2, a change gear 3, and each bulbs 10, 11, and 13 are illustrated independently in drawing 1 , each [these] equipment is incorporated in one housing, and constitutes the automatic transmission. And the hydraulic pump which is not illustrated is built into a change gear 3, and it is constituted through the passage and each bulbs 10, 11, and 13 which the discharged oil of the hydraulic pump does not illustrate possible [supply in each pressure receiving rooms 8a, 9a, and 12c]. Said hydraulic pump is driven on the turning effort transmitted to a change gear 3 at the time of rotation of an engine 1.
[0041] A gearing 14 is really formed in input-shaft 3a of a change gear 3 pivotable, and the rotational frequency of input-shaft 3a is detected by the turbine rotational frequency sensor 15 which consists of magnetic pickup. The turbine rotational frequency sensor 15 outputs the pulse signal proportional to the rotational frequency of input-shaft 3a. A gearing 16 is really formed in output-shaft 3b of a change gear 3 pivotable, and the rotational frequency of output-shaft 3b is detected by the speed sensor 17 as a vehicle speed detection means which consists of magnetic pickup. A speed sensor 17 outputs the pulse signal proportional to the rotational frequency of output-shaft 3b.
[0042] The tilt cylinder to which tilt of the lift cylinder 20 and mast 21 which make the discharge side of the pump 18 for cargo work (hydraulic pump) driven with an engine 1 go up and down fork 19 through the duct which is not illustrated is carried out and which is not illustrated is connected. The load sensor 22 as a load detection means to detect the movable load of fork 19 is formed in the lift cylinder 20. The load sensor 22 consists of a pressure sensor which detects the oil pressure inside a lift cylinder 20, and outputs the detecting signal corresponding to the movable load of fork 19.
[0043] The accelerator pedal 23 as an accelerator actuation means, the inching pedal 24, and the brake pedal 25 are formed in the floor of a driver's cabin. In case the inching pedal 24 performs crawling transit of a fork lift truck, doing a cargo work activity, it is used in order to change a clutch into a half-connection condition (half-clutch condition). And when operating a brake pedal 25 (it breaks in), a brake pedal 25 operates independently with the inching pedal 24, but when operating the inching pedal 24 (it breaks in), the inching pedal 24 and the brake pedal 25 consist of the middles possible [linkage]. That is, although the inching pedal 24 is moved independently with a brake pedal 25 in the inching field where the amount of treading in is shallow (actuation), if an inching field is passed and it becomes the brake field where the amount of treading in is deep, a brake pedal 25 will move to the inching pedal 24 and one. In addition, a brakes operation means is constituted by the inching pedal 24 and the brake pedal 25.
[0044] The accelerator sensor 26 as an accelerator control input detection means to detect the control input of an accelerator pedal 23 outputs the detecting signal proportional to the control input of an accelerator pedal 23. The inching sensor 27 which detects the control input of the inching pedal 24 outputs the detecting signal proportional to the control input of the inching sensor 27.
[0045] A brake pedal 25 is mechanically connected with the hydraulic treading strength generator (emulator) 28 as a treading strength generating means, and the brake sensor 29 which becomes the treading strength generator 28 from the pressure sensor as an amount detection means of brakes operation to detect the oil pressure of the interior, and a treading strength detection means is formed. The brake sensor 29 outputs the detecting signal proportional to the brake treading strength when breaking in a brake pedal 25. It is detected by the brake switch 30

whether the brake pedal 25 was operated.
[0046] The shift lever (order ** lever) 31 as a shift actuation means is formed in the anterior part of a driver's cabin. The shift switch 32 as a shift actuated-valve-position detection means to detect the location of a shift lever 31 detects in any a shift lever 31 shall be between the advance location F, the go-astern location R, and a center valve position (neutral location) N, and outputs the signal corresponding to each location. Moreover, the lift lever 33 and tilt lever 34 as a cargo work actuation means are prepared in the anterior part of a driver's cabin. The lift-lever sensor 35 which detects the control input of a lift lever 33 outputs the detecting signal proportional to the control input of a lift lever 33. The tilt-lever sensor 36 which detects the control input of a tilt lever 34 outputs the detecting signal proportional to the control input of a tilt lever 34. Moreover, the mode change-over switch 37 as a setting actuation means is formed in the anterior part of a driver's cabin. Change-over actuation of the mode change-over switch 37 is carried out so that the deceleration of false dynamic brake can be chosen as the three-stage of the Hurd Normal software. Moreover, an engine speed is detected by the engine speed sensor 38 built in the engine 1. An engine speed sensor 38 outputs the pulse signal proportional to an engine speed.
[0047] Next, the electric configuration for carrying out drive control of said throttle actuator 7, the advance clutch bulb 10, the go-astern clutch bulb 11, and the parking-brake clutch bulb 13 is explained.
[0048] The control unit 41 is equipped with a central processing unit (henceforth CPU) 42, read-only memory (ROM) 43, read-out and the rewritable memory (RAM) 44, the input interface 45, and the output interface 46. In case a predetermined control program and a predetermined control program are performed to ROM43, various required data etc. are memorized. The result of an operation of CPU42 etc. is stored temporarily at RAM44. CPU42 operates based on the control program memorized by ROM43. In addition, a damping force generating means is constituted by both the clutch bulbs 10 and 11, the shift switch 32, and the control unit 41. Moreover, a control means is constituted by both the clutch bulbs 10 and 11 and the control unit 41.
[0049] CPU42 operates according to the various control programs memorized by ROM43, and outputs the throttle actuator 7 and the control command signal to each bulbs 10, 11, and 13 while it inputs said each sensors 15, 17, 22, 26, 27, 29, 35, 36, and 38 and the output signal of each switches 30, 32, and 37.
[0050] Said turbine engine-speed sensor 15, a speed sensor 17, the brake switch 30, the shift switch 32, the mode change-over switch 37, and the engine speed sensor 38 are connected to CPU42 through the input interface 45. The load sensor 22, the accelerator sensor 26, the inching sensor 27, the brake sensor 29, the lift-lever sensor 35, and the tilt-lever sensor 36 are connected to CPU42 through the A/D converter (analog-to-digital converter) and the input interface 45 which are not illustrated.
[0051] CPU42 is connected to the throttle actuator 7, the advance clutch bulb 10, the go-astern clutch bulb 11, and the parking-brake clutch bulb 13 through the output interface 46 and the drive circuit which is not illustrated, respectively.
[0052] Various kinds of maps (drawing 2 - drawing 4) used for ROM43 by various programs (drawing 8 - drawing 11) and various programs are memorized. Each program is performed at intervals of predetermined time (for example, 10-50msec.) during engine operation (inside of starter KION).
[0053] The false dynamic brake control routine of drawing 8 is a program for performing false dynamic brake control. The map M1 of drawing 2 is used by this routine.
[0054] The creep flag control routine of drawing 9 is a program for the control which carries out set-reset of the creep flag used when carrying out control to which creep transit is made to ensure at the time of the need to a fork lift truck.
[0055] The brake control routine of drawing 10 is a program for the control which generates the damping force according to the treading strength, when a brake pedal 25 is stepped on. The map M2 of drawing 4 is used by this routine. This routine is performed also when the inching pedal 24 is stepped on by the brake field.

[0056] The neutral brake control routine of drawing 11 is a program for performing brake control when stepping on a brake pedal 25 (the inching pedal 24 being included) in a shift center valve position. Since the shock is great when the clutch engagement pressure of both the clutches 8 and 9 is suddenly raised from the condition that are in a shift center valve position and advance / go-astern both the clutches 8 and 9 of both were separated, control which gave inclination is carried out to the standup of clutch engagement pressure for shock relaxation.
[0057] With this operation gestalt, the damping force of false dynamic brake and the damping force of the service brake by brakes operation have adopted the method generated by making the advance clutch 8 and the go-astern clutch 9 engaged. That is, the advance clutch 8 and the go-astern clutch 9 constitute the braking means. For this reason, it does not have conventionally the drum brake equipped as a service brake. Of course, it is possible to equip a drum brake etc. as an auxiliary brake.
[0058] The principle which generates the damping force of false dynamic brake is in the condition that full engagement of the clutch by the side of a shift was carried out among the advance clutch 8 and the go-astern clutch 9, and is based on making the clutch of the shift opposite side engaged in the state of a half-clutch. Damping force required for false dynamic brake is generated by making the clutch of this shift opposite side engaged in the state of a half-clutch. Half-clutch ** of the clutch of the shift opposite side is decided that the setting deceleration according to the mode chosen by the mode change-over switch 37 is acquired. Since this deceleration is influenced by not only the engagement pressure of the clutch of the shift opposite side but the body weight, he is trying to set up clutch ** in consideration of the load of a load of a fork lift truck.
[0059] The clutch ** data which can acquire the deceleration according to three kinds of modes of the Hurd Normal software to ROM43 are memorized. This data is clutch ** on the basis of an empty load (no load). The map M1 of drawing 2 is used for asking for the correction factor which amends this data to the value according to a load. On a map M1, the relation between a load and a correction factor is shown, a correction factor becomes large gradually with one or more values, so that a load increases, and such big clutch ** (that is, damping force) is set up that a load is heavy. Moreover, instead of using a correction factor, the map M10 of drawing 3 can be used and the approach of asking for clutch ** according to Load W for every mode can also be adopted. Clutch ** of such a big value will be decided for every mode that a load becomes heavy also in this case.
[0060] The hard mode is the deceleration (for example, about 0.3 G) of the conventional non-equipped torque-converter manual transmission vehicle average, software mode is about the same deceleration (for example, about 0.03 G) as a torque-converter equipment vehicle, and normal mode (middle mode) is set as the middle deceleration (for example, about 0.15 G) in the hard mode and software mode.
[0061] thus, if the configuration which hangs braking is taken in order to generate false dynamic brake, creep transit should be carried out when having not stepped on the accelerator pedal 23 -- by ****** dynamic brake, creep transit cannot be performed and fault arises. For this reason, in order to make false dynamic brake and creep transit live together, in order to carry out creep transit, when the creep mode in which false dynamic brake is not hung is set up and the creep flag stands, the control which does not operate false dynamic brake is adopted. The routine of drawing 9 controls this creep flag.
[0062] On the other hand, the principle by brakes operation which usually generates the damping force of a brake twists the advance clutch 8 and the go-astern clutch 9 to carry out coincidence engagement. The engagement pressure (henceforth FR coincidence engagement clutch **) when carrying out coincidence engagement of the advance clutch 8 and the go-astern clutch 9 is controlled to the value according to treading strength so that the damping force according to the treading strength of a brake pedal 25 is acquired at this time. The map M2 of drawing 4 is used in order to ask for FR coincidence engagement clutch ** Pfr from brake treading strength. The advance clutch 8 and the go-astern clutch 9 are controlled by FR coincidence engagement clutch ** Pfr of this ** value acquired with reference to both the maps M2 of drawing 4 . When considering as coincidence engagement of the order ** clutches 8 and 9 tends to separate the

clutch by the side of a shift and it tends to acquire damping force only by engagement of the clutch of the shift opposite side, it is because it becomes the same phenomenon as a switchback and loss of the damping force by internal slipping of a torque converter 2 occurs. Moreover, it is because a idle state is maintainable after slowing down to the vehicle speed "0", when making engagement pressure of the order ** clutches 8 and 9 into this ** value can control loss of the damping force by internal slipping of a torque converter 2 as much as possible and the forward/reverse rotation force of an order ** clutch is moreover balanced.

[0063] Next, the contents of a program of each routine shown in drawing 8 - drawing 11 are explained. The false dynamic brake control routine of drawing 8 is explained first. ** vehicle speed which is not broken into ** brake pedal which is not broken into ** accelerator pedal in step (it is only described as S below) 10 (accelerator OFF) (brake OFF (the case where it does not get into the inching pedal 24 to a brake field is included)) judges first whether 1 or more km/h and all four conditions of ** creep flag Fcreep=0 are satisfied. If all four conditions (**-**) are satisfied (i.e., if it is the actuation stage of false dynamic brake), it will progress to S20, and among ** - **, also on one condition, if abortive that is, when it is not the actuation stage of false dynamic brake, it will progress to S80.

[0064] In S20, it judges whether it is in hard mode. If it is in hard mode, it will progress to S40 and clutch ** Pcl=Ph will be set up. If it is not in hard mode, it will progress to S30.

[0065] In S30, it judges whether it is in software mode. If it is in software mode, it will progress to S50 and clutch ** Pcl=Ps will be set up. If it is not in software mode (i.e., if it is normal mode), it will progress to S60 and clutch ** Pcl=Pn will be set up. Here, there is relation of Ph>Pn>Ps to the set point and hardness, Normal, and big clutch ** Pcl in order of software are set up.

[0066] In S70, clutch ** Pcl is amended according to Load W. the amendment corresponding to Load W with reference to the map M1 of drawing 2 -- counting Kw asking -- clutch ** Pcl after amendment -- formula Pcl=Kw and Pcl It calculates. in addition, amendment -- counting Kw Instead of using it, the map M10 shown in drawing 3 is memorized to ROM43, and setting mode (hardness, Normal, software) and the method of asking for clutch ** Pcl according to Load W with reference to a map M10 can also be adopted.

[0067] On the other hand, when it gets into the accelerator pedal 23, or gets into the brake pedal 25, when at least one is abortive that is, or it gets into the inching pedal 24 to the brake field, the vehicle speed is less than 1 km/h in S10 or it is creep flag Fcreep =1 among ** - **, it progresses to S80 and clutch ** Pcl=0 is set up. That is, a setup to which false dynamic brake is not applied is carried out.

[0068] In S90, the clutch bulb of the shift opposite side is ordered the current value IPcl according to clutch ** Pcl. Therefore, as shown in drawing 5 , if treading in of an accelerator pedal 23 is stopped during transit (however, creep transit is removed) with the vehicle speed V1 of 1 or more km/h of vehicle speed (time of day To), the clutch of the shift opposite side will carry out half-clutch engagement by clutch ** Pcl according to setting mode in the condition that the clutch by the side of a shift carries out full engagement. Therefore, the damping force by the clutch of the shift opposite side engaging with the damping force of the original dynamic brake which works through a torque converter 2 with the engine-speed fall of an engine 1 by clutch ** Pcl according to setting mode is added, and the false dynamic brake of the strength according to setting mode works. Consequently, a fork lift truck is slowed down with the deceleration (betah, betan, betaS) according to setting mode (hardness, Normal, software). False dynamic brake is canceled when a brake pedal 25 is broken in, or brakes operation which breaks the inching pedal 24 into a brake field is carried out, an accelerator pedal 23 is broken in, and the vehicle speed turns into under the discharge vehicle speed (1 km/h).

[0069] Next, the creep flag control routine of drawing 9 is explained. In S110, it is in the condition (accelerator OFF) of not getting into the accelerator pedal 23, the condition (inching OFF) of not getting into the inching pedal 24, and the condition (brake OFF) of not getting into the brake pedal 25, and judges whether the vehicle speed V exceeded the creep setting vehicle speed (for example, 1 km/h). Here, the creep setting vehicle speed is the vehicle speed which will be passed by the time it changes to accelerating and reaches the discharge vehicle speed of false dynamic brake again, once false dynamic brake is canceled with the discharge vehicle

speed (this example 1 km/h) and the vehicle speed falls. With this operation gestalt, the creep setting vehicle speed is set as the same value as the discharge vehicle speed of false dynamic brake. When the vehicle speed accelerates under the above-mentioned pedal non-operating condition and the creep setting vehicle speed is exceeded (it passed), it sets to S120, and it is the creep flag Fcreep. It sets (Fcreep =1). That is, it becomes creep mode. On the other hand, it progresses to S130 at the time of the condition failure of S110.

[0070] it gets into the ** accelerator pedal 23 in S130 -- **** (accelerator ON) -- it gets into ** inching pedal 24 -- **** (inching ON) -- it gets into the ** brake pedal 25 -- **** (brake ON) -- it judges whether at least one of four conditions of ** of whether the ** shift lever 31 is in a center valve position - ** is materialized. ** If at least one of four conditions which are - **s is materialized, it will set to S140, and it is the creep flag Fcreep. It resets (Fcreep =0). It stops that is, being in creep mode. on the other hand -- all four conditions of ** - ** -- this routine is ended when abortive.

[0071] therefore, if treading in of an accelerator pedal 23 is stopped during transit with the vehicle speed V1 as shown in drawing 6 for example, the false dynamic brake will work, the vehicle speed V will fall with the deceleration of about 1 law, and false dynamic brake will be canceled at the time of day T1 when the vehicle speed V reaches the discharge vehicle speed Vo (for example, 1 km/h). Then, it is the creep flag Fcreep at the time of day T2 passed while the vehicle speed once falls, starts to accelerate and accelerates the creep setting vehicle speed Vo. It is set (Fcreep =1). Since the false dynamic brake does not work even if the vehicle speed V exceeds the discharge vehicle speed Vo in this creep mode, a fork lift truck continues creep transit, and it accelerates it until it reaches the maximum creep vehicle speed Vc. In addition, since the creep setting vehicle speed Vo is passed and it becomes creep mode (Fcreep =1) at the time while the vehicle speed V accelerates when a fork lift truck does not break in an accelerator pedal 23 from a idle state but carries out creep start, creep transit of a fork lift truck is attained also in this case.

[0072] Next, the brake control routine of drawing 10 is explained. In S210, it judges first whether the brake switch 30 is ON. That is, it gets into the brake pedal 25, or judges whether it is getting into the inching pedal 24 to the brake field (both the brake ON). If it is Brake ON, it will progress to S220, and this routine will be ended if it is not Brake ON.

[0073] In S220, it judges whether a shift lever 31 is in a center valve position. If it is in a center valve position, it will shift to a neutral brake control routine. About this routine, it mentions later. If there is nothing in a center valve position, it will progress to S230.

[0074] In S230, it judges whether the vehicle speed is the halt vehicle speed. The halt vehicle speed is the vehicle speed it can consider that suspended the fork lift truck, and even if it hangs a parking brake, it is the low vehicle speed of extent stopped that there is so no shock (vehicle speed V= 0). For example, let the vehicle speed of under the predetermined value within the limits of 1 - 4 km/h be the halt vehicle speed with this operation gestalt with the vehicle speed of less than 5 km/h. When the vehicle speed is not the halt vehicle speed, it progresses to S240, and when the vehicle speed is the halt vehicle speed, it progresses to S290.

[0075] S240-S280 are processings for brake control, and S290-S310 are processings for the control which operates a parking brake. In S240, initial coincidence engagement clutch ** Po of FR is set up. Since a detection value tends to differ in the weak initial actuation field of the treading strength of a brake pedal 25 for an oil pressure controller, the treading strength generator 28 has set up initial coincidence engagement clutch ** Po of FR so that required damping force may be guaranteed certainly, though it is small, if it is Brake ON.

[0076] In the following S250, it asks for FR coincidence engagement clutch ** Pfr according to the brake pressure at the time of getting into the brake pedal 25 detected by the brake sensor 29 of the treading strength generator 28 (brake treading strength) with reference to the map M2 of drawing 4 .

[0077] In S260, FR coincidence engagement clutch ** Pfr judges whether it is taking a bigger value than initial coincidence engagement clutch ** Po of FR (Pfr>Po). If Pfr>Po is materialized, it will progress to S280, and if Pfr>Po is abortive, in S270, initial coincidence engagement clutch ** Po of FR will be adopted as FR coincidence engagement clutch ** Pfr.

[0078] In S280, it is ordered the current value IPfr corresponding to clutch ** Pfr to the advance clutch bulb 10 and the go-astern clutch bulb 11, respectively. It judges whether on the other hand in S290, it continued beyond fixed time amount to which the brake-on condition was beforehand set under the halt vehicle speed. This fixed time amount is set as less than 1 second, and if it is the conditions which can judge whether it is actuation with the volition which stops a fork lift truck, that setup time can be changed suitably. When the duration of the brake-on condition under the halt vehicle speed does not fulfill fixed time amount, it progresses to S240 and brake control is continued. On the other hand, if a brake-on condition continues beyond fixed time amount under the halt vehicle speed, it will progress to the following S300.
[0079] And in S300, while ordering both the clutch bulbs 10 and 11 the current value IPo which extracts clutch ** of the order ** clutches 8 and 9, in the following S310, the parking-brake clutch bulb 13 is ordered the current value IPb at the time of hanging a parking brake 12.
[0080] Therefore, when a brake pedal 25 is broken in during transit of a fork lift truck or the inching pedal 24 is broken into a brake field, damping force is acquired because the advance clutch 8 and the go-astern clutch 9 engage with coincidence by same clutch ** Pfr. That is, the advance clutch 8 and the go-astern clutch 9 function as a service brake. Although only the clutch of the shift opposite side can be made engaged and damping force can also be acquired, by adopting FR clutch coincidence engagement, loss of the damping force by internal slipping of a torque converter 2 is suppressed small, and still more powerful damping force is acquired. Especially, since it is FR coincidence engagement of same clutch ** Pfr, loss of the damping force by internal slipping of a torque converter 2 ends small as much as possible, and powerful damping force is secured.
[0081] moreover -- the initial actuation field where treading in of a brake pedal 25 is shallow -- the treading strength generator 28 -- oil pressure -- standing -- hard -- a treading strength detection value (brake pressure) -- dispersion -- being easy . However, since the direction of initial clutch ** Po is adopted in the initial actuation field where clutch ** Pfr decided from the treading strength of a brake pedal 25 is smaller than initial clutch ** Po as shown in drawing 7 , though brake treading strength is small also in a weak initial actuation field, required damping force is guaranteed certainly.
[0082] Moreover, since advance turning effort and go-astern turning effort are balanced when a fork lift truck stops by brakes operation, both the clutches 8 and 9 carry out coincidence engagement by same clutch ** Pfr and it becomes the vehicle speed "0", a fork lift truck is held at the idle state of the vehicle speed "0." Moreover, when brakes operation is carried out of the volition which stops a fork lift truck, brakes operation is continued beyond fixed time amount with the halt vehicle speed, and while both the clutches 8 and 9 are separated, parking brakes 12 are mostly applied to coincidence with this. A parking brake's actuation of an accelerator pedal 23 cancels it. For this reason, since it is in the condition that the parking brake 12 worked even if it stops brakes operation, when it stops, for example at a ramp, even if it stops brakes operation for re-start, worries about a roll back disappear.
[0083] Next, the neutral brake control routine of drawing 11 is explained. In S220 of a brake control routine (drawing 10), when a shift lever 31 is judged to be in a center valve position, this routine is performed. When it is in a shift center valve position, if it is under transit, it will run, where both the clutches 8 and 9 of both are separated. For this reason, if FR coincidence engagement is made to carry out at a stretch, since the moderation shock is great, processing which makes a shock ease will be performed at a stretch.
[0084] In S410, it judges whether the vehicle speed is the halt vehicle speed. If it is not the halt vehicle speed, it will progress to S420, and it judges whether it is activation of this 1st routine. If it is the 1st time, initial clutch ** Pfilt of a filter will be set up in S430. If it is 2nd henceforth, it will progress to S440.
[0085] In the following S440, it asks for FR coincidence engagement clutch ** Pfr according to the brake pressure at the time of getting into a brake pedal 25 (brake treading strength) with reference to the map M2 of drawing 4 .
[0086] Filtering of clutch ** Pfr is performed in S450. The filtering value ffilt (Pfr) computed using Pfr from filter-function ffilt (x) is newly set with Pfr. In addition, ffilt (x) is what expressed

the filter function symbolically, for example, also uses the data of past clutch ** Pfr for primary filter operation expression or count a large number are equivalent to each operation expression, such as filter [degree] operation expression, and according to the operation expression.
[0087] In S460, it is ordered the current value IPfr corresponding to clutch ** Pfr to the advance clutch bulb 10 and the go-astern clutch bulb 11, respectively. When it is judged that the vehicle speed is the halt vehicle speed in S410, while, ordering both the clutch bulbs 10 and 11 the current value IPo which extracts clutch ** of the order ** clutches 8 and 9 in S470 on the other hand, the parking-brake clutch bulb 13 is ordered the current value IPb at the time of hanging a parking brake 12 in the following S480. In addition, processing of S430 and S450 is equivalent to the processing which makes the starting inclination of the clutch engagement pressure in claim 9 ease.
[0088] Therefore, where the shift lever 31 was operated in the center valve position and both the clutches 8 and 9 of both are separated, while running, when brakes operation is carried out, it is ordered in the current value IPfr corresponding to the value after filtering of clutch ** Pbrk decided from brake treading strength. For this reason, since the standup inclination of clutch ** at the time of coincidence engagement of the order ** clutches 8 and 9 being carried out becomes loose, the shock at the time of brakes operation initiation becomes small.
[0089] Moreover, since it can consider that the shift lever 31 is sometimes operated in the center valve position in the intention which stops a fork lift truck, if a fork lift truck slows down to the halt vehicle speed, it will shift to a parking brake from a pedal brake (FR clutch coincidence engagement brake). In addition, in a neutral brake control routine, it cannot be overemphasized that the processing (processing equivalent to S240,260,270) for guaranteeing the damping force in the weak initial actuation field of brake treading strength may be prepared.
[0090] With the gestalt of this operation, it has the following effectiveness.
(1) since it is the configuration which makes false dynamic brake effective using coincidence engagement of the order ** clutches 8 and 9, braking use frequency increases by false dynamic brake method adoption -- the maintenance eggplant frequency of a damping device can be finished comparatively few relatively. Since it is especially a wet clutch, the cooling effect is high, and since it excels in endurance that generation of heat by braking is controlled and wear of clutches 8 and 9 cannot occur easily, the reduction effectiveness of maintenance frequency is high. A maintenance eggplant free-lancer is also realizable with selection of the clutch quality of the material etc.
[0091] (2) Although it is a fork lift truck (torque converter vehicle) equipped with a torque converter 2, effectiveness of the dynamic brake of the car average which is not equipped with a torque converter can be obtained.
[0092] (3) Since the strength of false dynamic brake can be set up using the mode change-over switch 37, an operator can get the feeling of moderation of false dynamic brake according to liking. Therefore, though it is the fork lift truck of a torque converter vehicle, about the same feeling of moderation as torque converter a non-equipped car can be obtained.
[0093] (4) Since clutch ** Pcl in consideration of a load is adopted, when the false dynamic brake works, the always almost same feeling of moderation can be obtained, without being influenced by the existence of a load, and the weight of a load.
[0094] (5) After false dynamic brake is canceled with the discharge vehicle speed Vo, if the creep setting vehicle speed Vo is exceeded after the vehicle speed starts to accelerate, it will become creep mode, and since the false dynamic brake does not work even if the vehicle speed V exceeds the discharge vehicle speed Vo, creep transit of a fork lift truck can be enabled in this creep mode.
[0095] (6) Since the order ** clutches 8 and 9 are used as a service brake operated when it gets into a brake pedal 25, considering braking use frequency, the maintenance eggplant frequency of a damping device can be finished few relatively. Since it is especially a wet clutch, the cooling effect of a clutch is high, and since generation of heat by braking is controlled, the wear rate of clutches 8 and 9 is controlled and it excels in endurance, the reduction effectiveness of maintenance frequency is high. For example, a maintenance eggplant free-lancer is also realizable with selection of the clutch quality of the material etc. Moreover, the drum

brake which was being used conventionally can be abolished.
[0096] (7) Since it is a brake by coincidence engagement of the order ** clutches 8 and 9, powerful damping force can be acquired compared with the brake of the single-sided engagement method with which only the clutch of the shift opposite side is made to engage. That is, since it can control that can give the turning effort of forward reverse both directions at coincidence to input-shaft 3a, and damping force loses by internal slipping of a torque converter 2 by carrying out coincidence engagement of the order ** clutches 8 and 9, high damping force is acquired. Since the method which carries out coincidence engagement especially of the order ** clutches 8 and 9 by same clutch ** Pfr is adopted, the braking loss by internal slipping of a torque converter 2 can be suppressed small as much as possible, and high damping force can be secured. Since it is furthermore coincidence engagement by same clutch ** Pfr of the order ** clutches 8 and 9, even when the forward/reverse rotation force at the time of coincidence engagement of the order ** clutches 8 and 9 is balanced, and not making the shift to a parking brake into the drop dead halt back temporarily or not adopting the shift to a parking brake, a fork lift truck can be held to the idle state of the vehicle speed "0."
[0097] (8) If a brake pedal 25 is stepped on and a fork lift truck slows down to the halt vehicle speed, since a parking brake 12 will operate, even if it stops brakes operation, the halt maintenance of the fork lift truck can be carried out. For example, since a parking brake will be effective when stopping a fork lift truck by the ramp by brakes operation, when re-departing, a roll back does not happen.
[0098] (9) Since it shifts to a parking brake when brakes operation continues beyond fixed time amount, when there is an intention which stops a fork lift truck, the parking brake can work. Therefore, since brakes operation duration is short even if it becomes the halt vehicle speed when brakes operation is only carried out for the purpose of moderation, the unnecessary parking brake does not work.
[0099] (10) A shock can be reduced when brakes operation is carried out during transit of a shift center valve position.
(11) When a brake pedal 25 is stepped on lightly, dispersion tends to occur in a treading strength detection value that oil pressure of the treading strength generator 28 adopted in order to acquire the damping force according to brake treading strength cannot stand easily, but since it was made to generate a fixed initial brake force even if the treading strength detection value was small, also when a brake pedal 25 is stepped on lightly, generating of required damping force can be guaranteed.
[0100] (2nd operation gestalt) The 2nd operation gestalt is explained below. With this operation gestalt, the clutch-type parking brake 12 is used as a damping device. In addition, the explanation is omitted using the sign same about the same configuration as said 1st operation gestalt, and only an especially different point is explained in detail.
[0101] The parking-brake clutch (parking brake) 12 constitutes the braking means of a clutch type from this operation gestalt. The parking-brake clutch bulb 13 consists of proportionality solenoid valves used as the opening proportional to the amount of energization to a solenoid. For this reason, the control which carries out continuation change of the clutch engagement pressure of a parking brake 12 is possible. In addition, a damping force generating means is constituted by the parking-brake clutch bulb 13, the shift switch 32, and the control unit 41. Moreover, a control means is constituted by the parking-brake clutch bulb 13 and the control unit 41.
[0102] Each program of the false dynamic brake control routine shown in drawing 12 , the brake control routine shown in drawing 15 , and the neutral brake control routine shown in drawing 16 is memorized by ROM43. Moreover, parking-brake clutch ** Pbrk for false dynamic brake corresponding to three kinds of modes in ROM43 Data are memorized. Furthermore in ROM43, it is brake treading strength to parking-brake clutch ** Pbrk. When asking, the map M20 (drawing 13) to be used is memorized. The program of each routine is performed by CPU42.
[0103] The false dynamic brake control routine first shown in drawing 12 is explained. In S10, the ** accelerator OFF, the ** brake OFF, and ** vehicle speed judge first whether 1 or more km/h and all four conditions of ** creep flag Fcreep=0 are satisfied. If it is all formation four condition,

it will progress to S20, and if at least one of four conditions is abortive, it will progress to S590.
[0104] In S20, it judges whether it is in hard mode. If it is in hard mode, while setting up clutch ** Pbrk=Ph according to the hard mode in S500, in the following S530, target decelerating beta=beta h according to the hard mode is set up. On the other hand, if it is not in hard mode, in S30, it will judge whether it is in software mode. If it is in software mode, while setting up clutch ** Pbrk=Ps according to software mode in S510, in the following S540, target decelerating beta=beta s according to software mode is set up. On the other hand, if it is not in software mode (i.e., if it is normal mode), while setting up clutch ** Pbrk=Pn according to normal mode in S520, in the following S550, target decelerating beta=beta n according to normal mode is set up. Here, the relation between Ph>Pn>Ps and beta h>beta n>beta s in the set point is, and big clutch ** Pbrk and the target deceleration beta are set up in order of hardness, Normal, and software.
[0105] In S560, it judges whether it is this 1st routine activation. If it is the 1st time, it will progress to S570, and if it is 2nd henceforth, it will progress to S580. It sets S570 and the parking-brake clutch bulb 13 is ordered the current value IPbrk according to clutch ** Pbrk.
[0106] It sets S580, and feedback control of the parking-brake clutch ** is carried out so that it may become the target deceleration beta. That is, a feedback control operation is performed using the detection value of the real vehicle speed, and the target deceleration beta, and it is ordered the current value IPbrk corresponding to clutch ** Pbrk obtained as the result of an operation. Clutch ** Pbrk (= Ph, Ps, Pn) set up in S570 at the time of this 1st routine activation is given as initial value of feedback control.
[0107] On the other hand, when it is not the actuation stage of false dynamic brake among four conditions (**-**) in S10 when at least one is abortive that is, it progresses to S590 and clutch ** Pbrk=0 is set up. That is, a setup to which false dynamic brake is not applied is carried out. And in S570, the parking-brake clutch bulb 13 is ordered the current value IPbrk according to clutch ** Pbrk (in this case, Pbrk=0).
[0108] Therefore, if treading in of an accelerator pedal 23 is stopped and the actuation stage of false dynamic brake comes, vehicle speed feedback control which makes desired value target deceleration beta according to the mode will be performed. Consequently, if the false dynamic brake works, it will slow down with the deceleration beta according to setting mode. Namely, when setting mode is the hard mode, it slows down by decelerating betas at the time of decelerating betan and software mode at the time of decelerating betah and normal mode. Since clutch ** Pbrk of a parking brake 12 is controlled to become the target deceleration beta by vehicle speed feedback control, the difference in the existence of a load or the weight of a load and the false dynamic brake of the deceleration same related always as whether a transit road surface is a ramp further work.
[0109] Therefore, if treading in of an accelerator pedal 23 is stopped and the actuation stage of false dynamic brake comes, vehicle speed feedback control which makes desired value target deceleration beta according to the mode will be performed. Consequently, if the false dynamic brake works, it will slow down with the deceleration beta according to setting mode. Namely, when setting mode is the hard mode, it slows down by decelerating betas at the time of decelerating betan and software mode at the time of decelerating betah and normal mode. It is clutch ** Pbrk of a parking brake 12 so that it may become the target deceleration beta by vehicle speed feedback control. Since it is controlled, the difference in the existence of a load or the weight of a load and the false dynamic brake of the deceleration same related always as whether a transit road surface is a ramp further work.
[0110] Next, the brake control routine of drawing 15 is explained. This brake control routine is fundamentally [as drawing 10 in said 1st operation gestalt] the same. That is, S210-S230 are the same contents of processing as drawing 10 , and have become the contents of processing in which S700-S740 carry out considerable to S240-S280 of drawing 10 , respectively.
[0111] Clutch ** Pbrk given to a parking brake 12 acquiring the damping force according to the brake treading strength of a brake pedal 25 since engagement of a parking brake 12 is used with this operation gestalt to having used coincidence engagement of the order ** clutches 8 and 9 with said 1st operation gestalt The value differs from the value of said clutch ** Pcl. For this

reason, clutch ** Pbrk for parking brakes In order to decide, the map 20 of drawing 13 is used. Clutch ** Pbrk for parking brakes in clutch ** set up in S700 and S710 in the flow chart of drawing 15 It becomes.
[0112] Moreover, although it judges whether the vehicle speed is the halt vehicle speed in S230, the halt vehicle speed at this time is smaller than the value at the time of said 1st operation gestalt, for example, is less than 1km/h. Current value IPb which will consider the parking-brake clutch 12 as full engagement in S750 if a car slows down to the halt vehicle speed It orders. There is no processing equivalent to S290 and S300 of drawing 10 . However, processing equivalent to S290 of drawing 10 , i.e., decision processing of whether the brake-on condition carried out fixed time amount continuation with the halt vehicle speed, may be put in before processing of S750. In this case, when the decision conditions of that processing to add are satisfied (YES), it progresses to S750, and it is made to progress to S700 at the time of failure (NO).
[0113] Therefore, it is clutch [parking brake / 12] ** Pbrk according to brake treading strength when a brake pedal 25 is broken in during transit of a fork lift truck or the inching pedal 24 is broken into a brake field. It is engaged and damping force is acquired. That is, a parking brake 12 functions also as a service brake.
[0114] Moreover, clutch ** Pbrk decided from the treading strength of a brake pedal 25 in the initial actuation field where treading in of a brake pedal 25 is shallow as shown in drawing 14 Initial clutch ** Pbo In the range of a small value, it is initial clutch ** Po. Since the direction is adopted, generating of damping force is guaranteed also in the initial actuation field where brake treading strength is weak.
[0115] Moreover, in order to stop a fork lift truck, when brakes operation is carried out, if it slows down to the halt vehicle speed, a parking brake 12 will operate. For this reason, even if it stops treading in of a brake pedal 25, there is no fear of carrying out a roll back. Moreover, there is also no need for the lever actuation for hanging a parking brake. Actuation of an accelerator pedal 23 cancels actuation of a parking brake 12 after this parking.
[0116] Next, the neutral brake control routine of drawing 16 is explained. This neutral brake control routine is fundamentally [as drawing 11 in said 1st operation gestalt] the same. That is, S410 and S420 are the same contents of processing as drawing 11 , and have become the contents of processing in which S800-S830 carry out considerable to S430-S460 of drawing 11 , respectively.
[0117] Clutch ** Pbrk given to a parking brake 12 from the relation using engagement of a parking brake 12 according to brake treading strength The value differs from the value of said clutch ** Pcl. Clutch ** Pbrk for parking brakes in clutch ** set up in S800 and S810 in the flow chart of drawing 16 It becomes.
[0118] Moreover, current value IPb which will consider the parking-brake clutch 12 as full engagement in S840 if a car slows down to the halt vehicle speed, although it judges whether the vehicle speed is the halt vehicle speed in S410 It orders. There is no processing equivalent to S470 of drawing 11 .
[0119] Therefore, it is clutch ** Pbrk decided from brake treading strength when brakes operation is carried out, while running, where the shift lever 31 was operated in the center valve position and both the clutches 8 and 9 of both are separated. It is ordered in the current value IPfr corresponding to the value after filtering. For this reason, since the standup inclination of clutch ** at the time of a parking brake 12 being engaged becomes loose, the shock at the time of brakes operation initiation becomes small. Moreover, since it can consider that the shift lever 31 is sometimes operated in the center valve position in the intention which stops a fork lift truck, if a fork lift truck slows down to the halt vehicle speed, it will shift to a parking brake from a pedal brake.
[0120] According to this operation gestalt, the effectiveness of (1) - (4) and (6) - (9) of having stated the difference between the order ** clutches 8 and 9 and a parking brake 12 with said 1st operation gestalt of a certain thing is acquired similarly. Clutch ** Pbrk especially made into target deceleration in the effectiveness of (4) Since vehicle speed feedback control is adopted, when the false dynamic brake works, to the difference pan of the existence of a load, or its

weight, the feeling of moderation same related always as whether a transit road surface is a ramp can be obtained. Moreover, since the vehicle speed set up as the halt vehicle speed is small about the effectiveness of (7), when there is an intention which stops a fork lift truck, the parking brake works, it does not result in the halt vehicle speed at the time of the brakes operation aiming at moderation, but, if possible, it can avoid an unnecessary parking brake.
[only] When a brake-on condition, of course, carries out fixed time amount continuation under the halt vehicle speed, the completely same effectiveness as the configuration which shifts to a parking brake, then the above (7) is acquired.
[0121] (3rd operation gestalt) Next drawing 17 - drawing 19 are used, and the 3rd operation gestalt is explained. The auxiliary brake is prepared in the driving wheel side as a part of service brake which operates when the brake pedal 25 besides the clutch type braking means of each of said operation gestalt is operated.
[0122] As shown in drawing 17 , the auxiliary brake 50 as an auxiliary braking means is formed in the driving wheel 5. An auxiliary brake 50 consists of small drum-brake equipment and a small disc brake gear. It connects through the master cylinder and hydraulic line (neither is illustrated) by which machine connection was carried out with the brake pedal 25, and an auxiliary brake 50 is driven so that the damping force according to treading strength may occur according to the force of oil pressure according to the treading strength of a brake pedal 25.
[0123] As a braking means of a clutch type, the order ** clutches 8 and 9 or a parking brake 12 is used, and the control approach is the same as that of said each operation gestalt. However, an auxiliary brake 50 bears a part of damping force which needs to be generated according to the treading strength of a brake pedal 25. For this reason, brake clutch ** Pfr (or Pbrk) (continuous line) of a value smaller than the value (broken line) set up with said each operation gestalt by the ratio equivalent to the damping force which an auxiliary brake 50 bears is set to the map M30 used in order to ask for brake clutch ** Pfr (or Pbrk) from brake treading strength, as shown in drawing 18 . As shown in drawing 19 , the clutch type brakes 8 and 9 (or 12) which are the main brakes bear the rate (for example, 6 - 80 percent) exceeding the one half of the damping force Fb generated according to brake treading strength (CB field in this drawing), and an auxiliary brake 50 bears the remaining ratios (for example, 2 - 40 percent) of damping force Fb (SB field in this drawing).
[0124] With the configuration whose clutch type brakes 8 and 9 (or 12) bear 100% of the damping force Fb like said each operation gestalt, the shake return phenomenon of a car body occurs at the time of a fork-lift-truck halt. That is, in order to hang braking inside a change gear 3, when a fork lift truck stops, a driving wheel 5 rolls from an original halt location to an excess according to inertia, ****** arises on power transfer shafts, such as an output shaft between a change gear 3 and a differential gear 4, and when the ****** reverts, the shake return phenomenon in which a car body shakes by a driving wheel 5 being reversed a little occurs.
[0125] However, with this operation gestalt, when a brake pedal 25 is broken in, the clutch type brakes 8 and 9 (or 12) in the interior of a change gear 3 and the auxiliary brake 50 prepared in the driving wheel 5 operate to coincidence. For this reason, ****** of power transfer shafts, such as an output shaft, does not occur between a change gear 3 and a driving wheel 5, and the shake return phenomenon of a car body does not happen. Therefore, a fork lift truck can be stopped, without seldom being accompanied by the shake of a car body. Since a driving wheel 5 is directly stopped by the auxiliary brake 50 prepared especially in the driving wheel 5, shake return of the car body at the time of a fork-lift-truck halt can be prevented effectively.
[0126] (4th operation gestalt) Next drawing 20 is used and the 4th operation gestalt is explained. Although electric control was adopted as making the braking means of a clutch type engaged with the clutch engagement pressure according to the treading strength of a brake pedal with said each operation gestalt, the braking control unit by mechanical control is adopted with this operation gestalt.
[0127] As shown in drawing 20 , each pressure receiving rooms 8a and 9a of the advance clutch 8 and the go-astern clutch 9 are connected with two output ports of a solenoid operated directional control valve 62 through ducts 60 and 61. A solenoid operated directional control valve 62 is a 4 port 3 location change-over valve, and change-over control is carried out by

current value control of the solenoids 62a and 62b by the controller 63 in the change-over location according to the actuated valve position of a shift lever 31 based on the detecting signal from the shift switch 32. The duct 65 which extends from the master cylinder 64 by which actuation connection was mechanically carried out with the brake pedal 25 is connected to one input port of a solenoid operated directional control valve 62. A master cylinder 64 generates oil pressure according to treading strength when a brake pedal 25 is operated (output). the near location where the duct 66 connected to other one input port of a solenoid operated directional control valve 62 is connected to a hydraulic pump 67, and a hydraulic pump 67 carries out the regurgitation of the oil pumped up from the oil tank 68 on this duct 66 -- the order from the upstream -- the regulator bulb 69 and electromagnetism -- the proportional expression pressure regulating valve 70 is formed. A pressure regulating valve 70 regulates the pressure of the oil pressure of the downstream to setting oil pressure by carrying out current value control of the solenoid 70a by the controller 63. In addition, the parking brake and the speed sensor are omitted in this drawing. Moreover, a damping force generating means is constituted by the shift switch 32, a solenoid operated directional control valve 62, ducts 60, 61, 65, and 66, a controller 63, a master cylinder 64, a pressure regulating valve 70, the regulator bulb 69, and the hydraulic pump 68 in this operation gestalt. The braking means of a clutch type is constituted by the advance clutch 8 and the go-astern clutch 9.

[0128] When a shift lever 31 is in a center valve position, a controller 63 arranges a solenoid operated directional control valve 62 in N location. When a solenoid operated directional control valve 62 is in N location, as for a duct 66, the duct 65 connected to the mast cylinder 64 while the free passage was intercepted and both the order ** clutches 8 and 9 changed into the cutting condition opens any of two ducts 60 and 61 for free passage with both two ducts 60 and 61. If a brake pedal 25 is stepped on in this condition, the oil pressure according to that treading strength will act on both the pressure receiving rooms 8a and 9a from a master cylinder 64, coincidence engagement of the order ** clutches 8 and 9 will be carried out with the engagement pressure according to brake treading strength, and the damping force according to brake treading strength is acquired.

[0129] When a shift lever 31 is in an advance location, a controller 63 arranges a solenoid operated directional control valve 62 in F location. When a solenoid operated directional control valve 62 is in F location, the duct 65 connected to the master cylinder 64 opens a duct 66 for free passage with a duct 61 while it is open for free passage with a duct 60 and only the advance clutch 8 will be in a connection condition. If a brake pedal 25 is stepped on in this condition, the oil pressure according to that treading strength will act on pressure receiving room 9a from a master cylinder 64, where the advance clutch 8 by the side of a shift is connected, coincidence engagement of the go-astern clutch 9 of the shift opposite side is carried out with the engagement pressure according to brake treading strength, and the damping force according to brake treading strength is acquired.

[0130] When a shift lever 31 is in a go-astern location, a controller 63 arranges a solenoid operated directional control valve 62 in R location. When a solenoid operated directional control valve 62 is in R location, the duct 65 connected to the master cylinder 64 opens a duct 66 for free passage with a duct 60 while it is open for free passage with a duct 61 and only the go-astern clutch 9 will be in a connection condition. If a brake pedal 25 is stepped on in this condition, the oil pressure according to that treading strength will act on pressure receiving room 8a from a master cylinder 64, where the go-astern clutch 8 by the side of a shift is connected, coincidence engagement of the advance clutch 9 of the shift opposite side is carried out with the engagement pressure according to brake treading strength, and the damping force according to brake treading strength is acquired.

[0131] Moreover, if a controller 63 recognizes that a fork lift truck is in the halt vehicle speed (for example, 2 or less km/h) it can be considered that is a halt based on the detecting signal from a speed sensor, in order to make it the controller 63 have operated the parking brake, a fork lift truck is maintained by the idle state.

[0132] Moreover, when the brake switch which detects actuation of a brake pedal 25 is formed and a controller 63 detects brakes operation based on the detection signal from a brake switch,

the throttle actuator 7 can also be controlled to restrict an engine speed to a setting engine speed (for example, idle rpm).
[0133] The same effectiveness as said each operation gestalt is acquired from the gestalt of this operation. That is, since the order ** clutches 8 and 9 are used as a service brake operated when it gets into a brake pedal 25, considering braking use frequency, the maintenance eggplant frequency of a damping device can be finished few relatively. Since it is especially a wet clutch, generation of heat at the time of braking use of clutches 8 and 9 and a wear rate are controlled small, and it excels in endurance, and the reduction effectiveness of maintenance frequency is high. For example, depending on the selection order of the clutch quality of the material, a maintenance eggplant free-lancer is also realizable. Moreover, the damping device only adopted as the conventional braking, such as drum-brake equipment, can be abolished. Moreover, since it is the braking method which carries out coincidence engagement of the order ** clutches 8 and 9, powerful damping force can be acquired compared with the single-sided engagement method with which only the clutch of the shift opposite side is made to engage. If having become the halt rate which can furthermore consider that a car is a halt based on the signal from a speed sensor is recognized, since a parking brake will be operated, a fork lift truck can be held to a idle state. In addition, the following effectiveness is acquired further.
[0134] (12) Since it is the method which is made to act on the pressure receiving room of the clutch of the opposite side direct a shift-oil pressure generated by treading strength of brake pedal 25 side, and acquires damping force, brake responsibility becomes good and, moreover, can raise the brake feeling engine performance.
[0135] (13) When the configuration which restricts an engine speed to a setting engine speed is adopted on the occasion of brakes operation, the braking energy at the time of clutch engagement can be stopped small, and the oil-temperature rise inside a torque converter 2 can be suppressed low relatively.
[0136] In addition, the gestalt of operation is not limited to said contents, for example, can be carried out in the following modes.
O Although the mode in which the deceleration of false dynamic brake was set up was made into three kinds, it is good also as two kinds or four kinds or more. Moreover, setting actuation means, such as volume which can continuation adjustable set up (deceleration), can also be used in the strength of false dynamic brake. Of course, you may set up so that the strength of false dynamic brake may be decided uniquely beforehand. Though it is the fork lift truck equipped with a torque converter also in this case, the false dynamic brake force of the strong feeling of moderation of torque converter non-equipped **** can be acquired.
[0137] O The actuation stage conditions of false dynamic brake are not limited to the conditions of the aforementioned ** - **. For example, the stage when it gets into an inching pedal to an inching field at, and connection of a clutch is made a half-clutch is good also as a setup which does not hang false dynamic brake. Moreover, creep flag Fcreep It considers as the configuration which is not adopted and is the creep flag Fcreep. Conditions may be abolished. For example, if the value more than the maximum creep vehicle speed (for example, 4 km/h) in case an engine 1 is idling rotation is set as the discharge vehicle speed of false dynamic brake, coexistence with false dynamic brake and creep transit can be aimed at.
[0138] O In a brake control routine (drawing 10 , drawing 15), the control section (S240, S260, S270) prepared for the cure against dispersion of the treading strength detection value of the brake sensor 29 may be abolished. For example, if a highly precise treading strength generator is used rather than oil pressure reacts sensitively to treading strength, it is not necessary to take the above-mentioned measures. Moreover, since there is little detection value dispersion of the amount of treading in when a treading strength generator is made into the spring type instead of an oil pressure controller, the above-mentioned cure is unnecessary.
[0139] O In the false dynamic brake method which uses order ** clutches 8 and 9 like the 1st operation gestalt, the vehicle speed (deceleration) feedback control adopted with the 2nd operation gestalt may be applied. According to this configuration, fixed deceleration is related acquired by the weight of a load, etc. and the grade of a transit road surface when the false dynamic brake works.

[0140] O In the false dynamic brake method which uses a parking brake 12 like the 2nd operation gestalt, the clutch engagement pressure beforehand set up according to setting deceleration (for example, mode) like the 1st operation gestalt is given. In this case, in addition, it is good to decide clutch engagement pressure in consideration of a load.
[0141] O A clutch-type damping device is used only for the purpose of false dynamic brake. As service-brake equipment, the damping device of a certain non-clutch type is used from the former, such as a drum brake. That is, the false dynamic brake of the clutch braking type using coincidence engagement of the order ** clutches 8 and 9 or the clutch braking type using engagement of a parking brake 12 is adopted. Although brake use frequency increases also in this case, the maintenance frequency of a damping device cannot increase easily.
[0142] O A clutch-type damping device is used only for the purpose of a service brake. For example, false dynamic brake is not adopted. That is, the service-brake equipment of the order ** clutch 8, the clutch braking type using 9 coincidence engagement, or the clutch braking type using engagement of a parking brake 12 is adopted. The maintenance frequency of a damping device can be reduced compared with the case where the conventional drum brake etc. is used comparatively [with high brake use frequency] also in this case.
[0143] O A separate clutch-type damping device realizes false dynamic brake and a service brake. For example, the order ** clutch 8 and the clutch braking type using 9 coincidence engagement are adopted as false dynamic brake equipment, and the clutch braking type which uses engagement of a parking brake 12 as service-brake equipment is adopted. Moreover, contrary to this, the clutch braking type which uses engagement of a parking brake 12 as false dynamic brake equipment is adopted, and the order ** clutch 8 and the clutch braking type using 9 coincidence engagement are adopted as service-brake equipment. According to these configurations, the wear rate per clutch can be reduced and the maintenance frequency of a clutch can be reduced further.
[0144] O It not only controls the engagement pressure of the clutch of the shift opposite side, but you may control the engagement pressure of the clutch by the side of a shift by false dynamic brake using coincidence engagement of the order ** clutches 8 and 9 to coincidence.
[0145] O The service-brake equipment using coincidence engagement of the order ** clutches 8 and 9 is sufficient if it is the coincidence engagement to which both clutches are made to engage with coincidence, and it is not limited to making equal engagement pressure of both the clutches 8 and 9. For example, the clutch by the side of a shift may control only the engagement pressure of the clutch of the shift opposite side with full engagement, or may be coincidence engagement which makes engagement pressure of the clutch of the shift opposite side higher than the engagement pressure of the clutch by the side of a shift. If it is coincidence engagement of both the clutches 8 and 9, the braking loss by internal slipping of a torque converter 2 can be controlled, and that much high damping force can be acquired. In addition, when the engagement pressure of both the clutches 8 and 9 is not equal, for example, if it is made coincidence engagement pressure, or shifts to a parking brake and grazes when the vehicle speed turns into the halt vehicle speed, a fork lift truck can be stopped.
[0146] O The setting deceleration set as false dynamic brake may be changed according to the vehicle speed. By torque converter a non-equipped vehicle, since the feeling of moderation according to the rotational frequency difference of engine idle rpm and the rotational frequency corresponding to the real vehicle speed is obtained, according to the vehicle speed, deceleration, i.e., clutch engagement pressure, may be changed so that the same feeling of moderation as torque converter a non-equipped vehicle may be obtained.
[0147] O The setting actuation means of the mode change-over-switch 37 grade for changing the strength of false dynamic brake may be abolished. For example, the decelerating data (clutch ** data) of false dynamic brake are beforehand memorized in memory, such as ROM, and the clutch engagement pressure of a clutch type braking means is controlled so that the deceleration as the data is acquired.
[0148] O In neutral brake control, the processing which makes the starting inclination of clutch engagement pressure ease is not limited to filtering. For example, feedback control may be carried out so that clutch engagement pressure may start with predetermined inclination.

[0149] O In the 3rd operation gestalt, it is not limited to preparing an auxiliary brake in a driving wheel 5. If it is the location of the driving wheel approach on the power transfer path to a change gear 3 and a driving wheel 5, shake return of the car body at the time of a fork-lift-truck halt can be ******(ed) once. For example, an auxiliary brake may be prepared near [on a power transfer path / differential-gear 4].
[0150] O In the 3rd operation gestalt, it is not limited to a clutch type brake and an auxiliary brake always operating together. As long as an auxiliary brake operates at least at the time of a car halt, it may be sufficient for it, for example, it may operate an auxiliary brake 50 only at the time of a fork-lift-truck halt. It considers as the configuration whose control device 41 carries out actuation control of the auxiliary brake 50 by the oil pressure control which minded the solenoid valve in this case, if it is judged that the fork lift truck became the halt vehicle speed based on the vehicle speed detection value, an auxiliary brake 50 will be operated, and a driving wheel 5 is stopped directly. Even if it is the configuration of operating an auxiliary brake 50 only at the time of a fork-lift-truck halt, shake return of the car body of a fork lift truck can be prevented.
[0151] O With the 4th operation gestalt, as a configuration which the oil pressure generated by brake treading strength is made to act on the pressure receiving room of a clutch direct, and acquires damping force, although the order ** clutches 8 and 9 were diverted as a clutch for braking, a clutch type parking brake can also be diverted as a clutch for braking. The duct 65 connected to the master cylinder 64 by which actuation connection was carried out with the brake pedal 25 is connected to pressure receiving room 12c of a parking brake 12 through a solenoid operated directional control valve (not shown), and the configuration which acquires the damping force according to brake treading strength by making the oil pressure produced in a master cylinder 64 by the treading strength of a brake pedal 25 act on pressure receiving room 12c of the parking-brake clutch 12 direct is adopted. Also by this configuration, since a parking brake is diverted as a service brake while being able to lessen the maintenance frequency of a damping device, the main damping device only for braking like drum-brake equipment can be made unnecessary, and, moreover, brake responsibility can be raised. In addition, while it has been in the condition which the oilway which the oilway to which the hydraulic oil of the set pressure from a hydraulic pump can flow to pressure receiving room 12c is chosen, and returns an oil to a master cylinder 64 from oil tank 68 grade was chosen, for example, was effective in treading in of a brake pedal 25 after the stop at the time of a stop, it is made for a brake pedal 25 to return to an initial valve position in the change-over location of the solenoid operated directional control valve at the time of parking-brake actuation.
[0152] O As a braking means of a clutch type, clutches other than order ** clutch 8 and 9 and parking-brake clutch 12 are employable.
O The braking means of a clutch type is not limited to a wet clutch. Since the wear rate of a clutch is slow enough compared with wear rates, such as lining of the conventional drum brake etc., even if it is a dry clutch, the maintenance frequency of a damping device can be reduced by adoption of a clutch type brake.
[0153] O The industrial vehicle which applies a braking control device may be applied not only to a fork lift truck but to a front end loader etc. Invention of those other than the claim which can be grasped from said each operation gestalt and example of another (technical thought) is indicated with the effectiveness below.
[0154] (1) In either of claims 1-14, the braking means established on the drive transfer shaft to which between said torque converters and said driving wheels is connected is a wet clutch. According to this configuration, since a braking means is a wet clutch, the cooling effect of generation of heat at the time of braking is high, a clutch cannot be easily worn out, and the maintenance frequency of a braking means can be reduced further. For example, depending on the clutch quality of the material, a maintenance free is also realizable.
[0155] (2) In either of claims 1-6, an industrial vehicle is equipped with a vehicle speed detection means, and said control means suspends clutch engagement pressure control of said braking means for generating false dynamic brake as the vehicle speed is below the predetermined vehicle speed. According to this configuration, since the false dynamic brake does not work

below with the predetermined vehicle speed, creep transit is attained.
[0156] (3) In the technical thought of the above (2), it has a vehicle speed detection means to detect the vehicle speed, if it judges that said control means exceeded the setting vehicle speed while the vehicle speed accelerated in the condition that an accelerator actuation means is not operated, creep mode will be set up, and in creep mode, even if the vehicle speed exceeds said predetermined vehicle speed, don't operate false dynamic brake. False dynamic brake can be made effective according to this configuration to the vehicle speed smaller than the maximum vehicle speed of creep transit, without barring creep transit.
[0157] (4) In either of claims 7-11, the braking means of said clutch type has diverted the said advance clutch [of a lot] and go-astern clutch, or clutch-type parking brake. Since it diverts as a braking means for acquiring the damping force [clutch / which was prepared on the drive transfer shaft for other purpose from the first] according to brakes operation according to this configuration, the main braking means only for braking can be made unnecessary.
[0158] (5) The advance clutch and go-astern clutch of a lot serve as the braking means of said clutch type, and said damping force generating means makes a shift side clutch and the clutch of the opposite side engaged among said advance clutches and go-astern clutches in claim 7 and the technical thought of the above (4) with the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired, when said brakes operation means is operated. Since it diverts as a braking means for acquiring the damping force [clutch / an advance clutch and / go-astern] according to brakes operation according to this configuration, the main braking means only for braking can be made unnecessary.
[0159] (6) A clutch-type parking brake serves as the braking means of said clutch type, and said damping force generating means makes said clutch-type parking brake engaged in claim 7 and the technical thought of the above (4) with the clutch engagement pressure from which the damping force according to the control input of said brakes operation means is acquired, when said brakes operation means is operated. Since it diverts as a braking means for acquiring the damping force [parking brake / clutch-type] according to brakes operation according to this configuration, the main braking means only for braking can be made unnecessary.
[0160] (7) In claim 9, said control means adopts initial clutch ** as control of the clutch engagement pressure of said braking means, when it is a value with the clutch engagement pressure smaller than the initial clutch engagement pressure beforehand set to the initial fields of brakes operation decided according to the detection value of said treading strength detection means. According to this configuration, in the initial field of brakes operation, generating of the fixed brake force according to initial clutch ** can be guaranteed.
[0161] (8) In invention of claim 14, said auxiliary braking means is formed in said driving wheel. According to this configuration, the shake return at the time of a car halt can be prevented much more effectively.
[0162]
[Effect of the Invention] Since false dynamic brake is generated using the braking means of a clutch type established on the drive transfer shaft to which between a torque converter and driving wheels is connected according to invention of claims 1-6 as explained in full detail above, although braking use frequency becomes high, maintenance frequency can be finished few.
[0163] According to invention of claims 2-6, since the setting deceleration of false dynamic brake can be chosen according to liking by actuation of a setting actuation means in addition to the effect of the invention of claim 1, the feeling of moderation according to liking of an operator can be obtained.
[0164] Since clutch engagement pressure is decided [according to invention of claims 3-6] in consideration of the weight of the load loaded into the industrial vehicle in addition to claim 1 or the effect of the invention of 2, when the false dynamic brake works, the same feeling of moderation can always be obtained, without being influenced by the existence and the load of a load of an industrial vehicle.
[0165] According to invention of claims 4 and 6, since damping force is generated using coincidence engagement of an advance clutch and a go-astern clutch in addition to the effect of

the invention of any 1 term of claims 1-3, even if braking use frequency increases by adoption of false dynamic brake, the maintenance frequency of a damping device cannot increase easily comparatively [the].

[0166] According to invention of claims 5 and 6, since damping force is generated using clutch engagement of a parking brake in addition to the effect of the invention of any 1 term of claims 1-3, even if braking use frequency increases by adoption of false dynamic brake, the maintenance frequency of a damping device cannot increase easily comparatively [the].

[0167] Since according to invention of claim 6 in addition to the effect of the invention of any 1 term of claims 1-5 vehicle speed feedback control of the clutch engagement pressure of a braking means is carried out so that the setting deceleration of false dynamic brake may be acquired, the feeling of moderation same related always as the existence and the load of a load of an industrial vehicle can be obtained.

[0168] Since the damping force according to the control input of a brakes operation means is generated using the braking means of a clutch type established on the drive transfer shaft to which between a torque converter and driving wheels is connected according to invention of claims 7-14, the maintenance frequency of a braking means can be reduced compared with damping devices, such as a drum brake currently used conventionally.

[0169] Since according to invention of claims 9-14 an initial brake force fixed in the initial field of actuation is given even if a treading strength detection value differs in the field which operated the brakes operation means lightly by having adopted the hydraulic treading strength generating means in addition to the effect of the invention of claim 8, even if brake treading strength is weak, generating of damping force can be guaranteed.

[0170] Since the starting inclination of the clutch engagement pressure of a braking means is eased when brakes operation is carried out [according to invention of claims 10-14] in addition to claim 8 or the effect of the invention of 9, where a shift actuation means is operated in a center valve position, a shock when brakes operation is carried out during transit in the condition that are in a shift center valve position and the clutch was separated can be eased.

[0171] A roll back can be prevented, since according to invention of claims 11-14 a parking-brake means operates when in addition to the effect of the invention of any 1 term of claims 8-10 a brakes operation means is operated and it stops, for example, when brakes operation is stopped after a stop by the ramp for re-start.

[0172] According to invention of claim 12, since the damping force according to the control input of a brakes operation means is acquired using coincidence engagement of an advance clutch and a go-astern clutch in addition to the effect of the invention of any 1 term of claims 8-11, even if braking use frequency is high, it can be managed by the maintenance frequency of a damping device few comparatively [the].

[0173] According to invention of claim 13, since the damping force according to the control input of a brakes operation means is acquired using clutch engagement of a parking-brake means in addition to the effect of the invention of claims 8-11, even if braking use frequency is high, it can be managed by the maintenance frequency of a damping device few comparatively [the].

[0174] Since according to invention of claim 14 damping force also joins the location of the driving wheel approach on the power transfer path from a change gear to a driving wheel with an auxiliary braking means when an industrial vehicle stops by brakes operation in addition to the effect of the invention of any 1 term of claims 8-13, it can be made hard to occur shake return of the car body at the time of a car halt.

[Translation done.]